

final report

# Mongolian Social Accounting Matrix 2014

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## Final Report 3

### Mongolian Social Accounting Matrix 2014

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#### **Abstract**

This paper shows the construction of the Mongolian Social Accounting Matrix (SAM) as of 2014. The SAM has 56 sectors, 70 commodities, two types of production factors (capital and labor), three types of institutions (households, government and the rest of the world) along with capital accounts, three types of taxes (direct taxes, import duties and indirect taxes on commodities) and investment accounts (public investment, private investment and changes in inventories).

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## **1. Introduction**

The Mongolian Social Accounting Matrix (SAM) 2014 is constructed using the Supply and Use Tables (SUT), government budget data from the National Statistical Office (NSO) and the balance of Payments (BoP) from International Monetary Fund (IMF) as primary data sources.<sup>1</sup> The SAM is a square matrix with 210 columns and rows. Its accounts consist of 56 sectors and 70 commodities, two production factors (capital and labor), three types of institutions (households<sup>2</sup>, government and rest of the world) along with their capital accounts which are discussed later, three types of taxes (direct taxes, import duties and indirect taxes on commodities) and investment accounts (public investment, private investment and changes in inventories).

The paper is structured as follows. Section 2 presents the “proto” SAM and explains the adjustments made in the SAM. Section 3 discusses the new accounts in the SAM including new sectors/commodities and capital accounts for institutions. Section 4 presents the aggregation of the SAM. Section 5 analyzes the structure of Mongolian economy based on the aggregated SAM.

## **2. The « proto » SAM and adjustments**

### **2.1. The “proto” SAM**

The first version of the SAM without any adjustments or augmentations is called a “proto” SAM. Table 1 shows the “proto” macro SAM as a share of nominal GDP in 2014 which was 22.2 trillion MNT.<sup>3</sup> As can be seen, household consumption contributes more than half of GDP (57%) while the current government expenditure is 13% of GDP. Gross fixed capital formation and inventory changes account jointly for 35% of GDP. The values of both export and import are more than half of GDP (52% and 57% respectively). The economy is highly intensive in capital – i.e., about 70% of the value added is payments to capital owners. The share of value added in GDP is 90.1% and the remaining 9.9% is from indirect taxes on commodities (7.7%), import duties (1.6%) and net taxes on production (0.5%).

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<sup>1</sup> Other data sources are mentioned in their relevant sections in this note.

<sup>2</sup> The “households” account includes firms and households. Therefore, some statements about households also matters for firms.

<sup>3</sup> This is a version of the SAM where all industries and commodities are aggregated into one account.

**Table 1. The “proto” macro SAM 2014 (percent of GDP)**

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Labor								0.4	26.3				26.8
2	Capital								0.0	63.8				63.8
3	Households	25.4	57.6		10.4				2.4					95.7
4	Government			4.7		13.4	1.6	7.7	0.3	0.5	0.0			28.2
5	TD			13.4										13.4
6	TM										1.6			1.6
7	TI										7.7			7.7
8	ROW	1.4	6.3	1.5	0.8						57.1			67.0
9	Sectors										185.8			185.8
10	Commodities			56.6	13.0				52.2	95.1	20.1	28.6	6.6	272.4
11	GFCF			19.6	4.1				11.6					35.2
12	VSTK											6.6		6.6
13	TOTAL	26.8	63.8	95.7	28.2	13.4	1.6	7.7	67.0	185.8	272.4	35.2	6.6	

Note: Lab – labor, Cap – capital, H – households, GVT – government, TI – indirect taxes on commodities, TM – import duties, TD – direct taxes, GFCF – gross fixed capital formation, VSTK – inventory changes, ROW – rest of the world.

## 2.2. Adjustments in the SAM

In the “proto” SAM, some sectors such as trade and livestock are highly capital intensity. But they are likely to be labor intensive given the sectoral structure of the labor force in Mongolia. According to our calculation using LFS 2013, 2014 and 2015, roughly 27% and 15% of total workers are in livestock and trade sectors respectively. In that sense, the value-added structure in the “proto” SAM may be unrealistic.

To be compatible with CGE model, the SAM must have exports at basic price and (trade and transport) margins associated with export – i.e., the composition of exports at purchaser price. In the “proto” SAM, we do not have this. Thus, we need to divide domestic production of each commodity into domestic supply and exports and distribute the margins into domestic and exports.

To make the SAM more realistic and suitable for a CGE model, we make a few adjustments in the SAM which are explained below. In doing so, we follow Cicowiez and Lofgren (2018) which constructs a SAM for Mongolia as of 2015.

### 2.2.1. Separating “mixed income” from gross operating surplus

In the 2014 SUT, value added in each sector is composed of compensation of employees, consumption of fixed capital and gross operating surplus. The former is considered as labor payments while the latter

two are considered as capital payments. The structure of value added – i.e., factor intensity in all sectors is given in Table 2 (see, Columns “labshr0” and “capshr0”). This structure may be unrealistic so that it could result in an inaccurate analysis and wrong simulation results. Because capital intensity in some sectors may be overestimated as gross operating surplus includes “mixed income” which is likely to be income of self-employed people, owners of small enterprises and employers. Although their production activities use labor, they tend to consider their income as profit of their activities and hence report such income as operating surplus as a whole rather than labor income. However, a part of their income should be considered as labor income which we call “mixed income”.

To fix this problem, we first calculate the number of salaried and non-salaried workers in each industry using LFS 2013, 2014 and 2015 which are shown in Table 2 (columns “salaried” and “non-salaried”). In doing so, we merge the data from LFS 2013, 2014 and 2015 to create a larger database and calculate the numbers as an average of 3 years. The survey participants report their sectors of activity which are consistent with the sectors in the SUT. We use the employment status of workers to define whether they are salaried or non-salaried. There are 6 types of employment status in the LFS:

- paid employee,
- employer,
- self-employed,
- member of a producer cooperative,
- employed in animal husbandry,
- unpaid family worker.

Paid employees and unpaid family workers are considered as “salaried” while employers, self-employed people, members of producer cooperatives and people employed in animal husbandry are considered as “non-salaried”. We also know each worker’s sector from the LFS data so that we are able to obtain the number of each type of workers in each industry. The average wage for each industry is calculated using the original values of compensation of employees in the SUT and the number of salaried workers which is computed from the LFS. By multiplying the number of non-salaried by the average wage, we find the values of “mixed income”. Then, these values are added on top of the original compensation of employees while being subtracted from the original capital payments. After this

adjustment, labor and capital intensity in each sector are recalculated which are also shown in Table 2 (columns “labshr1” and “capshr1”).<sup>4</sup> As a result of this adjustment, capital intensity in some sectors decrease significantly and even some of them turn out to be labor intensive. The sectors which are relatively more affected by the adjustment are livestock, agriculture, wearing apparels, leather, printing, repair and installation, trade, land and water transport sectors as these sectors include more “non-salaried” people. Generally, the magnitude of the change depends on the average wage and number of non-salaried people.

**Table 2. Structure of value added (before/after the adjustment) and number of salaried/non-salaried workers by sector**

	non_salaried	salaried	labshr0	capshr0	labshr1	capshr1
crop	7,091	5,922	19%	81%	41%	59%
animal	278,445	21,038	6%	94%	88%	12%
for	1,436	1,617	53%	47%	53%	47%
fish	64	64	7%	93%	14%	86%
coal	801	15,924	36%	64%	38%	62%
oil	-	762	3%	97%	3%	97%
metore	3,071	17,304	21%	79%	25%	75%
othmin	888	2,748	64%	36%	64%	36%
minsup	479	4,088	37%	63%	42%	58%
food	3,370	12,845	10%	90%	13%	87%
bev	175	4,656	22%	78%	23%	77%
tob	-	228	2%	98%	2%	98%
textile	1,589	4,100	20%	80%	28%	72%
wear	9,493	5,400	25%	75%	69%	31%
leather	4,320	2,325	33%	67%	95%	5%
wood	5,194	2,216	76%	24%	76%	24%
paper	-	361	62%	38%	62%	38%
print	413	1,378	47%	53%	62%	38%
coke	-	264	5%	95%	5%	95%
chem	181	173	41%	59%	85%	15%
pharma	393	1,141	34%	66%	46%	54%
rubplast	166	430	30%	70%	41%	59%
nonmetmin	1,852	5,654	31%	69%	42%	58%
basmet	178	2,330	19%	81%	21%	79%
fabmet	1,112	772	46%	54%	67%	33%
com	54	304	73%	27%	73%	27%
mach	-	414	19%	81%	19%	81%

<sup>4</sup> The “mixed income” adjustment is made for sectors where compensation of employees contributes less than half of the value added. If an adjusted capital payment turns negative, the share of labor payment in the value added is assumed to be 2/3 for that particular sector.

































## Appendix 1. Abbreviations of the names of the sectors in the SUT

Abbreviation	Full name	Abbreviation	Full name
crop	Crop production, related service activities	coke	Manufacture of coke and refined petroleum products
animal	Animal production, hunting	chem	Manufacture of chemicals and chemical products
for	Forestry and logging	pharma	Manufacture of basic pharmaceutical products and pharmaceutical preparations
fish	Fishing and aquaculture	rubplast	Manufacture of rubber and plastics products
coal	Mining of coal and lignite	nonmetmin	Manufacture of other non-metallic mineral products
oil	Extraction of crude petroleum and natural gas	basmet	Manufacture of basic metals
metore	Mining of metal ores	fabmet	Manufacture of fabricated metal products, except machinery and equipment
othmin	Other mining and quarrying	com	Manufacture of computer, electronic and optical products
minsup	Mining support service activities	mach	Manufacture of machinery and equipment n.e.c.
food	Manufacture of food products	motveh	Manufacture of motor vehicles, trailers and semi-trailers; other machinery and equipment n.e.c.
bev	Manufacture of beverages	furn	Manufacture of furniture
tob	Manufacture of tobacco products	othman	Other manufacturing
textile	Manufacture of textiles	med	Manufacture of medical and dental instruments and supplies
wear	Manufacture of wearing apparel	repins	Repair and installation of machinery and equipment
leather	Manufacture of leather and related products	elec	Electricity, gas, steam and air conditioning supply
wood	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	water	Water supply; sewerage management
paper	Manufacture of paper and paper products	waste	Waste management and remediation activities
print	Printing and reproduction of recorded media	cons	Construction
trade	Wholesale and retail trade; repair of motor vehicles and motorcycles	real	Real estate activities
lw-trans	Land and water transport	pro	Professional, scientific and technical activities
a-trans	Air transport	adm	Administrative and support service activities
warehouse	Warehousing and support activities for transportation	pubad	Public administration and defence; compulsory social security
post	Postal and courier activities	edu	Education
accom	Accommodation and food service activities	health	Human health and social work activities

info	Information and communication	art	Arts, entertainment and recreation
fina	Financial service activities, except insurance and pension funding	othser	Other service activities
insu	Insurance, reinsurance and pension funding, except compulsory social security	othact	Other activities
auxfin	Activities auxiliary to financial service and insurance activities		

## Appendix 2. Transaction Cost Model (TCM)

The model is a system of linear equations with the same number of equations and endogenous variables – i.e., the model is square. It takes some information from the SUT and generates values for all endogenous variables as described below.

TCM takes the values of the following from the SUT as exogenous:

- Domestic production at basic price;
- Exports at purchaser price;
- Imports at basic price;
- Aggregate transaction costs by commodity.

TCM generates values for the following endogenous variables:

- Exports at basic price;
- Domestic supply at basic price;
- Share of transaction costs in total raw trade values by commodity. The model assumes that all transaction costs of a commodity are the same constant share of their corresponding raw trade values – i.e., there is only one share for each commodity.
- Eventually, transaction costs related to exports, transaction costs related to imports and domestic transaction costs are computed using the shares and raw trade values.

Before running the model, we only have domestic production at basic price. On the other hand, we have the composition of domestic production for each commodity with TCM – i.e., we know how much is exported and how much is domestically sold. We only know how much is paid by foreigners for exports without TCM. In contrast, we have the distribution of these values between producers and transaction costs with TCM.

### Appendix 3. Mapping between industries in aggregated and detailed SAM

Agriculture	Crop production, related service activities, forestry, logging, fishing and aquaculture
Livestock	Animal production and hunting
Domestic coal	Mining of domestic coal and lignite
Exported coal	Mining of exported coal
Crude oil	Extraction of crude petroleum and natural gas
Metal ores	Mining of metal ores
Other mining	Other mining and quarrying, mining support service activities
Food	Manufacture of food products, beverages and tobacco products
Textile	Manufacture of textiles, wearing apparel, leather and related products
Coke and chemicals	Manufacture of coke, chemicals, chemical products, rubber and plastics products, basic pharmaceutical products, pharmaceutical preparations and other non-metallic mineral products
Manufacturing	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; Manufacture of paper and paper products; Printing and reproduction of recorded media; Manufacture of basic metals; Manufacture of fabricated metal products; Manufacture of computer, electronic and optical products; Manufacture of machinery and equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of furniture; Manufacture of medical and dental instruments and supplies; Repair and installation of machinery and equipment; Other manufacturing.
Electricity	Electricity, gas, steam and air conditioning supply
Water	Water supply, sewerage management, waste management and remediation activities
Construction	Construction
Trade	Wholesale and retail trade; repair of motor vehicles and motorcycles
Transportation	Land, water and air transport, warehousing and support activities for transportation
Railway	Railway transport
Accommodation	Accommodation and food service activities
Information	Information, communication, postal and courier activities
Financial activities	Financial service, insurance, reinsurance and pension funding (except compulsory social security) and activities auxiliary to these activities
Public administration	Public administration and defence; compulsory social security
Education	Education
Health	Human health and social work activities
Other activities	Real estate activities, professional, scientific and technical activities, administrative and support service activities, arts, entertainment, recreation and other activities

#### Appendix 4. Mapping between commodities in aggregated and detailed SAM

Agriculture	Products of agriculture, horticulture and market gardening, forestry and logging products, fish and other fishing products
Livestock	Live animals and animal products (excluding meat)
Domestic coal	Domestic coal and lignite; peat
Exported coal	Exported coal
Crude oil	Crude petroleum and natural gas
Metal ores	Metal ores
Other mining	Stone, sand, clay and other minerals, natural water
Electricity	Electricity, town gas, steam, hot water and water distribution
Food	Meat, fish, fruit, vegetables, oils, fats, dairy products, egg products, grain mill products, starches and starch products, other food products, beverages and tobacco products
Textile	Yarn, thread, woven and tufted textile fabrics, textile articles other than apparel, knitted or crocheted fabrics, wearing apparel, leather, leather products and footwear
Manufacturing	Products of wood, cork, straw and plaiting materials; Pulp, paper and paper products; printed matter and related articles; Furniture, other transportable goods; Basic metals; Fabricated metal products, except machinery and equipment; General-purpose machinery; Special-purpose machinery; Office, accounting and computing machinery; Electrical machinery and apparatus; Radio, television and communication equipment and apparatus; Medical appliances, precision and optical instruments, watches and clocks; Transport equipment.
Fuel	Refined petroleum products
Coke and chemicals	Coke oven products, nuclear fuel, basic chemicals, other chemical products, man-made fibres, rubber and plastics products, glass, glass products and other non-metallic products
Construction	Construction services
Trade	Wholesale and retail trade services
Accommodation	Accommodation, food and beverage services
Transportation	Passenger transport services, freight transport services other than railway, rental services of transport vehicles with operators and supporting transport services
Railway	Railway transport services for coal export
Financial activities	Financial and related services
Information	Telecommunications, broadcasting, information supply services, postal and courier services
Public administration	Public administration and other services provided to the community as a whole; compulsory social security services
Education	Education services
Health	Human health and social care services
Other services	Real estate services; Leasing or rental services without operator; Research and development services; Legal and accounting services; Other professional, technical and business services;



	<p>Support services; Support services to agriculture, hunting, forestry, fishing, mining and utilities; Maintenance, repair and installation services; Manufacturing services on physical inputs owned by others; Other manufacturing services, publishing, printing and reproduction services, materials recovery services; Sewage and waste collection, treatment and disposal and other environmental protection services; Services of membership organizations; Recreational, cultural and sporting services; Other services; Domestic services.</p>
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